

WHAT IS CLAIMED IS:

1. A display apparatus, comprising:

a plurality of substantially totally internally reflecting (TIR) light guides for expanding a small original optical representation from an input of each light guide to
5 a larger optical representation output at an output of each light guide.

2. The display apparatus of claim 1, wherein each of said plurality of substantially totally internally reflecting light guides is formed from a light guide material, and further wherein each of said plurality of substantially totally internally reflecting light guides is separated from other substantially totally internally reflecting
10 light guides by a material of lower index of refraction than the light guide material.

3. The display apparatus of claim 1, wherein said plurality of substantially totally internally reflecting light guides provides an angular offset between input and output.

4. The display apparatus of claim 1, wherein said original optical
15 representation comprises a pixel of an image.

5. The display apparatus of claim 1, wherein the output of each substantially totally internally reflecting light guide comprises a beveled surface.

6. The display apparatus of claim 5, further comprising a reflecting element located proximate to and coupled optically with, through the use of
20 transparent material with similar index of refraction as the light guide, the beveled surface, the reflecting element comprising at least one reflector oriented to receive light energy from said beveled surface and reorient the light energy to an angle substantially more perpendicular to the beveled surface.

7. The display apparatus of claim 6, wherein the reflecting element
25 comprises a plurality of reflectors oriented to receive multiple light beams from the beveled surface and reflect the multiple light beams at predetermined angles.

8. The display apparatus of claim 7, wherein the plurality of elements in the reflecting element prevent light from exiting the light guide at a side away from the beveled surface.

5 9. The display apparatus of claim 7, wherein the plurality of elements in the reflecting element trap ambient light, thereby enhancing contrast of the display apparatus.

10. The display apparatus of claim 6, wherein the output face of the reflecting element is coated with material to enhance durability and structured to enhance viewing.

10 11. The display apparatus of claim 7, wherein the output face of the reflecting element is coated with material to enhance durability and structured to enhance viewing.

12. The display apparatus of claim 1, wherein each substantially totally internally reflecting light guide comprises plastic.

15 13. The display apparatus of claim 1, wherein each substantially totally internally reflecting light guide comprises acrylic.

14. The display apparatus of claim 2, wherein the material of lower index of refraction comprises air.

20 15. The display apparatus of claim 2, wherein the material of lower index of refraction comprises glue.

16. A method for producing a display apparatus, comprising:

providing a layer of light guide material;

placing a layer of material of lower index of refraction on said light guide material;

alternately depositing a predetermined quantity of additional layers of light guide material and additional layers of material of lower index of refraction atop the light guide material to form a layered laminated stack; and

5 cutting channels into the layered laminated stack, thereby creating a plurality of substantially totally internally reflecting (TIR) light guides.

17. The method of claim 16, further comprising providing a substrate and a base layer of material of lower index of refraction on the substrate prior to providing the layer of light guide material, and wherein the layer of light guide material is provided to the base layer of material of lower index of refraction.

10 18. The method of claim 16, wherein said material of lower index of refraction comprises glue.

19. The method of claim 16, further comprising beveling an end of at least one substantially totally internally reflecting light guide subsequent to the channel cutting, thereby creating a beveled output surface.

15 20. The method of claim 16, further comprising providing a reflecting element proximate the beveled output surface.

21. The method of claim 20, further comprising providing a surface coating on the output face to improve durability and viewing.

20 22. The method of claim 16, wherein said light guide material comprises plastic and said material of lower index of refraction comprises glue.

23. The method of claim 16, further comprising depositing material of lower index of refraction in said channels.

24. An apparatus for providing light to a display, comprising:
a plurality of substantially totally internally reflecting (TIR) light guides
25 oriented to expand a relatively small original optical representation from an input of

each light guide to a relatively large optical representation output at an output of each light guide;

wherein each of said plurality of substantially totally internally reflecting light guides is separated from other substantially totally internally reflecting light guides by
5 a material having lower refraction index than each substantially totally internally reflecting light guide.

25. The apparatus of claim 24, wherein an aspect ratio for said relatively small original optical representation is substantially similar to an aspect ratio for said relatively large optical representation output.

10 26. The apparatus of claim 24, wherein the output of each substantially totally internally reflecting light guide comprises a beveled surface.

27. The apparatus of claim 26, further comprising a reflecting element located proximate to and coupled optically with, through the use of transparent material with similar index of refraction as the light guide, the beveled surface, the
15 reflecting element comprising at least one reflector oriented to receive light energy from said beveled surface and reorient the light energy to an angle substantially more perpendicular to the beveled surface.

28. The apparatus of claim 27, further comprising a surface layer on the output face of the reflecting element to enhance durability and viewing.

20 29. The apparatus of claim 24, wherein each substantially totally internally reflecting light guide is formed of plastic.

30. The apparatus of claim 24, wherein the material having lower refraction index than each substantially totally internally reflecting light guide comprises air.

25 31. The apparatus of claim 24, wherein the material having lower refraction index than each substantially totally internally reflecting light guide comprises glue.

32. The apparatus of claim 27, wherein the reflecting element comprises a plurality of reflectors oriented to receive multiple light beams from the beveled surface and reflect the multiple light beams at predetermined angles.

5 33. The apparatus of claim 32, wherein the plurality of elements in the reflecting element prevent light from exiting the light guide at a side away from the beveled surface.

34. The apparatus of claim 32, wherein the plurality of elements in the reflecting element trap ambient light, thereby enhancing contrast of the apparatus.